2014 Maryland FMP Report (July 2015)
Section 23. Brook Trout (*Salvelinus fontinalis)*

Introduction

One of Maryland's most enjoyable but historically least publicized fishery resource is the native brook trout fishery. Commonly called "brookies" by those who fish for them, the brook trout is one of the most beautiful freshwater fish in Maryland. Like the lake and bull trout, brook trout are a member of a group of fish known as charr - the English name given to all members of this genus. Brook trout are highly valuable to Maryland for their recreational, economic, cultural and biological values. According to a study in Pennsylvania (Green et al. 2006), which has a similar wild brook trout fishery, wild trout anglers spent an average of $45 per day when fishing, contributing more than $2 million annually to local economies through direct and indirect expenses from fishing trips.

Because of their habitat and survival requirements, brook trout are typically found in Maryland's more pristine and remote areas. Biologically they are considered an indicator species, representative of a whole suite of unique aquatic and terrestrial organisms that occupy and share habitat. The brook trout is an iconic symbol of clean water and healthy aquatic systems since it's unable to thrive in poor water quality or degraded habitat. The disappearance of brook trout serves as a warning about the health of our waters and watersheds, an aquatic "canary in the coal mine." The decline of brook trout populations in Maryland has been drastic. Based on an initial review completed by the Eastern Brook Trout Joint Venture (EBTJV) in 2006, brook trout have been eliminated from 62% of their historic habitat in Maryland. The remaining populations are considered reduced, occupying less than 10 percent of their historic range. With Maryland's human population expected to continue to grow over the next several decades, the future of brook trout in Maryland has reached a critical juncture. A major difficulty in managing the brook trout resource is that only 11% of all brook trout streams are fully within state lands, the vast majority of habitat is on private land and a mix of private/public lands. Most wild brook trout populations are relegated to headwater streams, where human disturbance is minimal and forest cover is still prevalent.

A Maryland Brook Trout Fisheries Management Plan (BTFMP) was developed in 2006 (Heft et al. 2006). Since then the plan has been annually updated and was formally reviewed in 2010 and 2013/2014.

Stock Status

Eastern brook trout populations have been declining throughout their native range (Maine to Georgia) in the eastern United States, and Maryland's populations are no exception. A 2006 assessment of brook trout status in 1,443 subwatersheds (sixth level hydrologic unit) located in the Chesapeake Bay watershed, resulted in 226 subwatersheds (16%) being classified as Intact (brook trout present in >50% of the streams); 542 (38%) were classified as Reduced (brook trout present in ≤50% of the streams), and 290 (20%) were classified as Extirpated (brook trout no longer exist in the streams) (Hudy et al. 2008). In Maryland, only 3 watersheds were classified as Intact (2%); 47 classified as reduced (33%); and 83 classified as extirpated (57%). Additionally, an approach was developed that assists with identifying subwatersheds with the greatest potential for successful brook trout protection, enhancement or restoration actions (Hanson et al. 2014). In the Chesapeake Bay watershed there are 103 Intact subwatersheds and 43 Reduced subwatersheds that are assigned high priority scores (≥0.79) for potential restoration, only one is in Maryland.

A finer scale assessment of brook trout populations in the Chesapeake Bay watershed was recently (2012-2014)

completed by the EBTJV in an effort to provide natural resource managers with better tools for detecting population changes and setting conservation priorities. This assessment entailed determining wild brook trout occupancy at the catchment scale (basically a single stream scale) and used to identify brook trout patches (Whiteley et al. 2013). A "patch" is defined as a group of contiguous catchments occupied by wild brook trout; patches are not connected physically (i.e., they are separated by a dam, unoccupied warm water habitat, downstream invasive species, etc.) and are assumed to be genetically isolated. The assessment found that there were 3,608 "Wild Brook Trout Only" patches in the Chesapeake Bay watershed with 166 patches in Maryland (4.5%).

Anthropogenic impacts have been identified as the primary reason for the documented declines with increasing urbanization, deforestation, exotic species, and mining being identified as a few of Maryland's most imminent threats. Likewise the future of Maryland's brook trout remains uncertain in the face of increasing water temperatures in response to climate change, the development of Marcellus shale natural gas resources, and an ever-increasing human population.

Status of the Fishery

The statewide angling regulation for brook trout is currently no closed season, two fish harvested per day, possession limit of four fish, and no minimum size. There is no commercial harvest or fishery for brook trout. There are several areas in the state with special regulations that are more restrictive than the general statewide regulation with the purpose of providing improved angling catch rates and the opportunity to catch large brook trout (Figure 1). These areas are described in the annually published Maryland Fishing Guide. Maryland's premier brook trout fishery occurs in Garrett County in the Upper Savage River mainstem and tributaries upstream of the Savage reservoir dam. This system supports the highest population densities and largest brook trout in the state. The streams are managed under catch and release rules with angling restricted to artificial lures only. Intensive monitoring of this fishery by DNR's Inland Fisheries Division has been conducted annually since 2006 and has shown progress towards meeting management objectives. Figure 2 shows the watersheds where brook trout historically occurred in Maryland. Figure 3 shows the current brook trout distribution as of 2014.

Status of Brook Trout FMP Work Effort

A focus area from the 2013/2014 BTFMP review was the development and implementation of a comprehensive statewide sampling schedule, as described in Action 11.1.1 of the FMP (*Action 11.1.1 Develop a monitoring schedule to insure that all brook trout populations statewide are sampled at least once every 3 years*). The initial sampling effort revealed that a 3 year rotation was not feasible so a new 5 year rotation was developed and initiated in 2014. Regional and Brook Trout Program staff were successful in meeting the revised sampling schedule. Staff anticipate that the 5 year sampling schedule is the best approach for meeting the FMP action. In 2014, staff were able to sample 71 of the scheduled 79 streams (90%). Since there was a limited time period for completing the sampling, streams that were not sampled in 2014 were added to the 2015 sampling schedule. Table 1 lists by river basin, the number of streams sampled and the number of brook trout collected.

A second recommended focus area from the FMP review process was developing a standardized sampling protocol for brook trout population sampling *(Strategy12.1. Develop a standardized sampling protocol for monitoring Brook Trout populations that includes: MBSS water quality and habitat data collection components; establishment of permanent*

sampling stations; number of stations per stream length; and fish collection methodology). The Maryland **Brook Trout Program Field Sampling Manual** (Sell and Heft 2014) was completed prior to the 2014 sampling season and was used by all Inland Fisheries Division staff involved with brook trout sampling efforts.

The third recommended focus area from the 2013 review was to create better ways to provide information to the general public about brook trout conservation and recreational opportunities. A Brook Trout Program webpage (http://dnr2.maryland.gov/fisheries/Pages/brook-trout/index.aspx) was created and is available online as part of the Fisheries Service website (Figure 4). The page provides information on statewide brook trout work and research. It links to numerous other state and national organizations involved with brook trout work.

Current Management and Restoration Efforts

As part of the 2014 Chesapeake Watershed Agreement, brook trout restoration was included as a specific outcome for the Vital Habitats goal. The outcome is to *Restore and sustain naturally reproducing Brook Trout populations in Chesapeake headwater streams with an eight percent increase in occupied habitat by 2025.* Staff is working with the EBTJV on the development of a management strategy for brook trout. This strategy will help guide restoration efforts in the Bay watershed to meet the Brook Trout Outcome and will be compatible with Maryland's BTFMP. Partners will be developing a biennial work plan with specific and measurable actions. Participants in this effort include: Maryland Department of Natural Resources, New York State Department of Environmental Conservation, Pennsylvania Fish and Boat Commission, Virginia Department of Game and Inland Fisheries, West Virginia Department of Natural Resources, United States Fish and Wildlife Service United States Geological Survey, Trout Unlimited, and Eastern Brook Trout Joint Venture.

Brook Trout Program staff continue to work with Trout Unlimited representatives, MD DNR Inland Fisheries staff, Carroll and Baltimore County natural resources staff, and the National Aquarium staff to develop and implement a brook trout restoration effort on a watershed scale for the upper Gunpowder River watershed (upstream of the Prettyboy reservoir). This watershed has been identified as having a high likelihood of success for brook trout habitat restoration and reintroduction, and at a larger scale than has been attempted before in Maryland. It will be a long term effort with the potential to provide a significant increase in the amount of habitat occupied by brook trout by 2025.

Brook Trout Program staff are working with the Maryland Department of the Environment's Abandoned Mine Lands Division on a watershed scale restoration effort within the Casselman River watershed. Acid mine drainage mitigation sites have been installed on tributaries within the watershed and trees have been planted to restore and protect stream habitat. Additional plantings of stream buffers are planned for 2015 - 2016. Water quality and brook trout monitoring will continue annually.

Issues of Concern

Initial statewide brook trout population sampling completed in 2014 revealed a substantial loss of historically occupied brook trout habitat in the Central region of Maryland. While not unexpected, this trend will likely continue as the 5 year sampling rotation is completed. Two major factors are likely responsible: increasing human development in this portion of the state and competition with invasive brown trout. Additional work in the Gunpowder River system is planned for restoration

work (upper Gunpowder River mainstem) and research related to brook trout movement within the watershed.

The recent discovery of gill lice *Salmincola edwardsii* in North Carolina brook trout populations is a potential concern for Maryland brook trout populations. This copepod is endemic to brook trout populations in the northern portion of their native range but has not been seen south of New England and the Great Lakes states. Typically, infestations were not considered significant at a population level but recent increases in parasite loads in Wisconsin and Minnesota are being suggested as contributing to drastic population declines (Mitro et al. 2014). Brook Trout Program staff have applied for grant funding through the State Wildlife Grant (SWG) program to investigate if gill lice are present in Maryland brook trout populations. If lice are found they will be genetically tested to determine their source of origin.

Additional issues of concern for Maryland brook trout conservation include determining angling effort and harvest, climate change impacts, continued human development pressure in brook trout watersheds, runoff of road salt into streams, and energy extraction and development issues (gas and wind). Angler and citizen input and volunteer effort will be vital for brook trout conservation as land use and development issues determine whether or not a habitat will continue to support brook trout survival. Participating in citizen watershed associations and angler advocacy groups can provide valuable and needed input to assist municipalities and counties with brook trout conservation. The Maryland DNR Brook Trout webpage lists sites and names of state and national groups that are working for brook trout conservation (http://dnr2.maryland.gov/fisheries/Pages/brook-trout/index.aspx).

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Table 1. 2014 Statewide Brook Trout Sampling Effort by River Basin, as per the MD DNR Brook Trout Fisheries Management Plan.

Year	River Basin	# Streams Sampled	Total Brook Trout Collected
2014	GU	3	3
2014	PA	11	0
2014	MP	8	193
2014	UNB	25	1692
2014	UP	3	9
2014	WC	2	16
2014	YG	19	468

GU = Gunpowder River; PA = Patapsco River; MP = Middle Potomac River; UNB = Upper North Branch Potomac River; UP = Upper Potomac River; WC = West Chesapeake Bay; YG = Youghiogheny River

Figure 1. Large Brook Trout Collected from the Upper Savage River Zero Creel Limit Special Management Area.

Figure 2. Historic Distribution of Brook Trout in Maryland by subwatersheds.

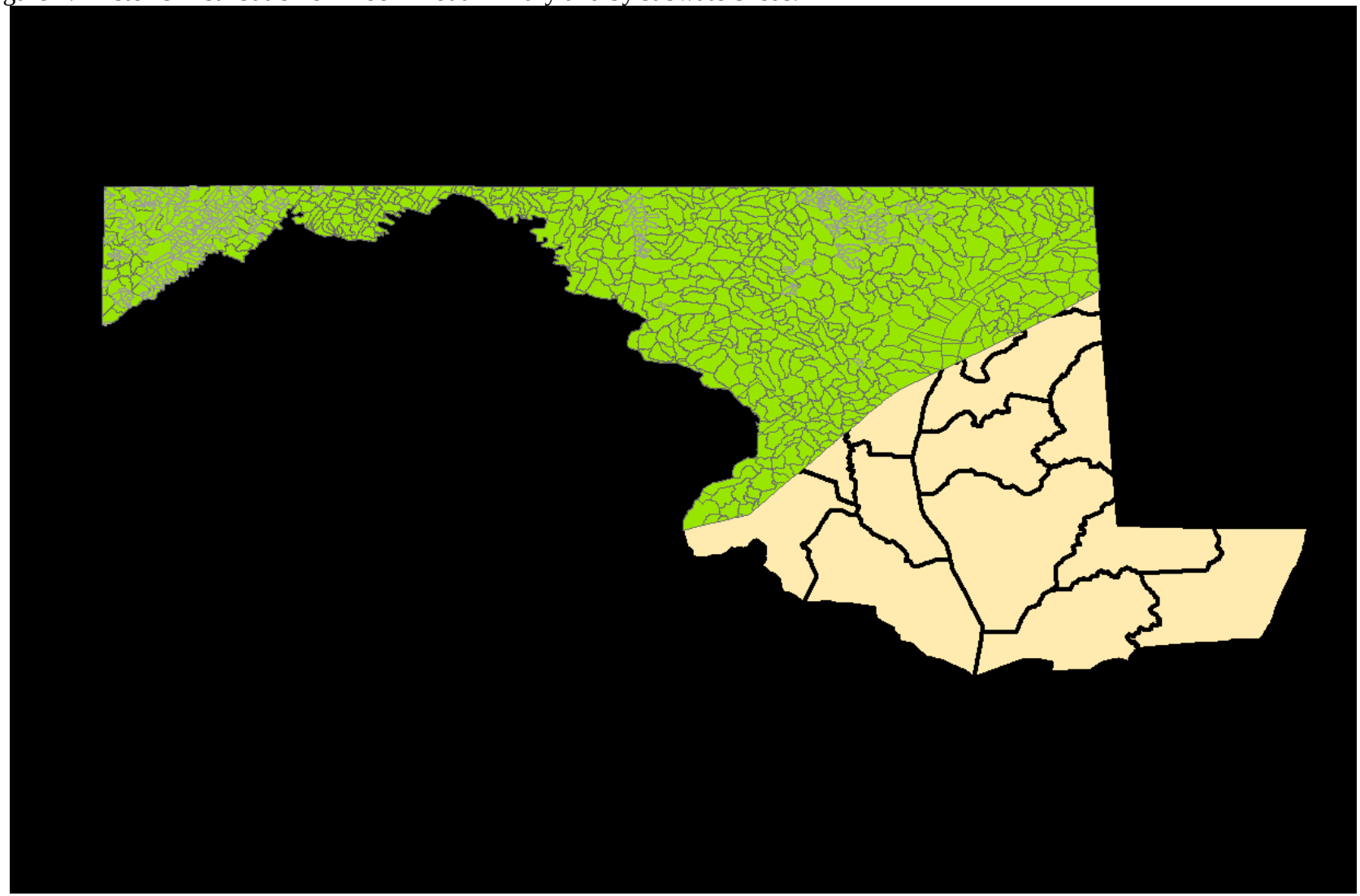

Figure 3. Current (2014) Distribution of Brook Trout in Maryland by subwatersheds.

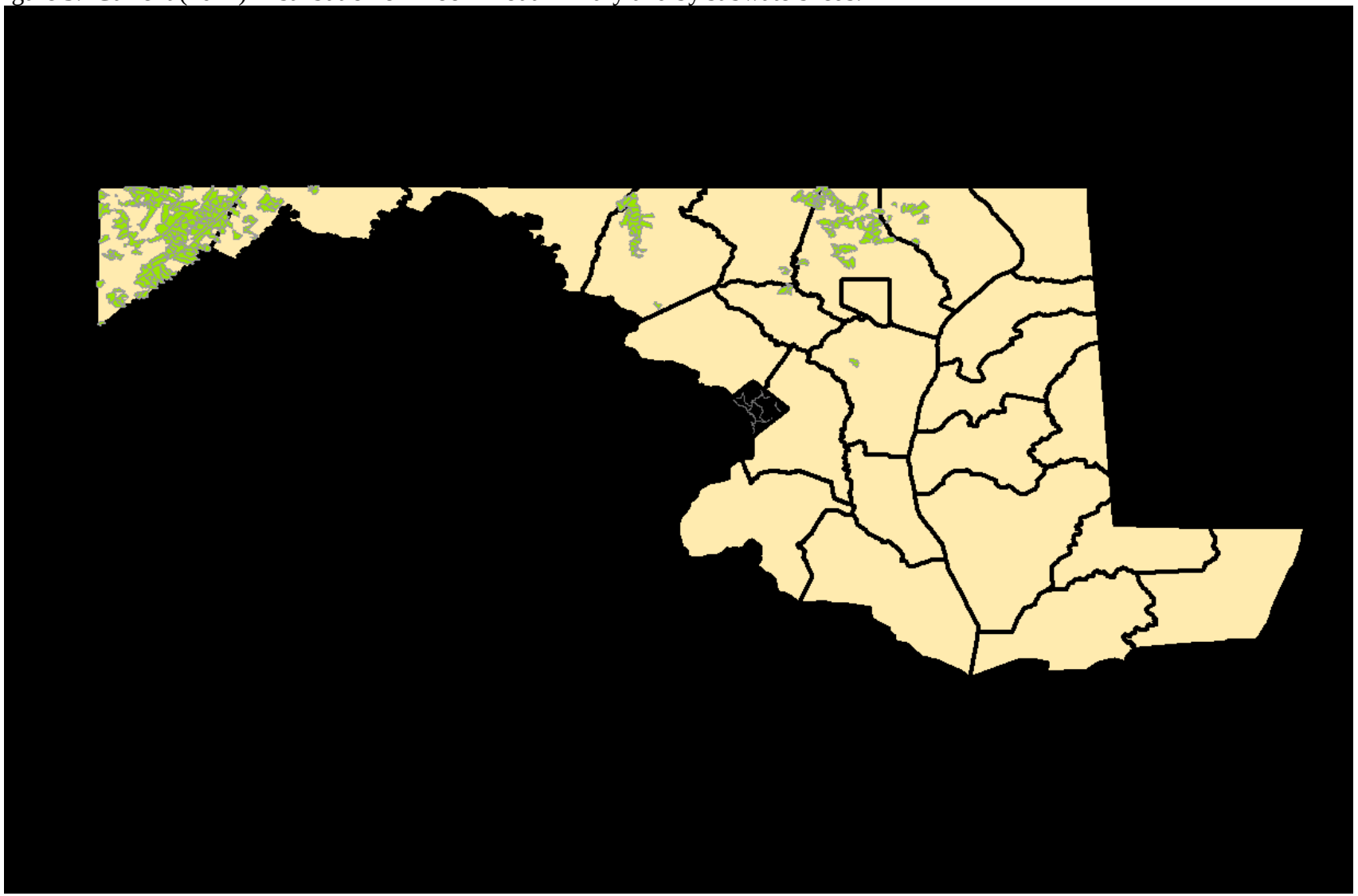

Figure 4. Maryland Brook Trout Program Webpage.

2006 Maryland Brook Trout Fishery Management Plan Implementation Table (updated 7/2015).
Boldface text indicates newly updated information. Light yellow background indicates priority strategies and actions for the upcoming year(s). Light turquoise background indicates strategies and actions that are functionally complete.

Strategy	Action	Date	Comments
Strategy 1.1 Investigate the life history characteristics, i.e. mortality, longevity, fecundity, growth rate, of Maryland brook trout populations statewide.	**Action 1.1.1** Identify and pursue additional funding sources to accomplish the needed work.	2009 - 2013 Continue **Projected completion 2015**	Joint research project with UMCES Appalachian Laboratory (AL) and MD DNR Fisheries. Funds included a SWG grant. Initiated study of brook trout life history study in the Savage River. This was the number 1 priority action in 2010. **Field work completed in 2013. Modeling and report completion is planned for 2015.**
Strategy 1.2 Investigate angler use and exploitation on Maryland brook trout populations statewide through creel surveys, and relate harvest and incidental angling mortality to brook trout length frequency structure and maximum fish size.	**Action 1.2.1** Identify and pursue additional funding sources to accomplish the needed work.	**2012-2013** **Statewide Pending, possible initiation in 2016**	**Upper Savage River creel survey completed.** **Statewide creel survey will be based on Upper Savage River creel survey. Funding necessary to expand survey statewide has not been identified. Earliest a statewide creel survey would be initiated is 2016.**
Strategy 2.1 Develop a GEP index for brook trout populations in the state of Maryland.	**Action 2.1.1** Submit a proposal for funding a GEP index research project to the Maryland DNR State Wildlife Grant program for FY07.	2007-2009 **Completed**	A SWG project report was completed in 2009. Report directs watershed associations and regional managers where to target conservation efforts.
Strategy 2.2 Utilize the index to categorize the status of brook trout populations in Maryland and create a priority list of those most at risk, and those for which conservation		2009 **On-going**	No action was formulated in the BTFMP. GEP index and report (Action 2.1.1) will be used to identify populations at risk by watershed and guide conservation efforts. Priority list will be developed during 2015 –

efforts would have long term potential for long term restoration.			2016.
Strategy 3.1 Identify and protect at- risk brook trout populations.	**Action 3.1.1** Determine at- risk populations by statewide fisheries region using current data, and then by using GEP index information once it becomes available.	**In progress Projected completion 2016**	This was the number 2 priority action (along with Action 13.1.3) in 2010. **Developing a GIS layer to identify and prioritize at-risk populations based on GEP and other risk factors. Additional resources are needed to continue project.**
	Action 3.1.2 Develop a priority list of populations to be protected, incorporating the GEP index value, land ownership (private versus public), upstream watershed size and land use, public resource access, connectivity to other brook trout populations, and recreational value.	**Pending**	Requires completion of 3.1.1. **The priority list will be generated when the GEP map has been developed.**
Strategy 4.1 Develop a brook trout management plan for the Savage River watershed upstream of the Savage River dam. This plan will be used as a blueprint for developing plans in other brook trout watersheds.	**Action 4.1.1** Develop a comprehensive Geographic Information System (GIS) database detailing land ownership and usage within the upper Savage River watershed, incorporating summer water temperatures and brook trout population abundance from the Maryland DNR's Inland Fisheries and MBSS databases.	2007 Continue	GIS project underway as a joint effort of MD DNR, Savage River Watershed Association, and the Izaak Walton League. **Final report is being drafted**.
	Action 4.1.2 Utilizing the GIS analysis, identify areas within the S R watershed that are impacting brook trout populations and water quality and develop a priority list of restoration/conservation activities.	2007 Continue	Requires completion of 4.1.1. **Final report is being drafted. Report will include a prioritized list of impacted brook trout populations.**

	Action 4.1.3 Identify areas within the Savage River that need additional conservation.	2007 Continue	Requires completion of 4.1.1. **Final report is being drafted. Report will identify focal conservation areas for watershed associations.**
Strategy 4.2 Present the information and recommendations in the BTFMP to the MD DNR Western Regional Team to solicit input and support.		2007 **Discontinued**	No action was formulated in the BTFMP. MD DNR Western Regional team was disbanded in 2007. Strategy is no longer practicable and is not being pursued.
Strategy 4.3 Develop a watershed-wide strategy for protecting habitat, Especially buffer protection and restoration in impacted headwater streams.		**Pending**	No action was formulated in the BTFMP. **Action: Create a stream buffer and land use/land cover map to locate areas of concern. Threshold for negative impacts is 2% impervious surface. The map will incorporate existing state and federal land preservation and buffer strip restoration programs.** **Development of a GIS layer is being explored. Anticipated to begin in 2017.**
Strategy 4.4 Identify adverse summer water temperature impact areas (impoundments, etc.) and develop strategies to alleviate the impacts.		**2007** **On-going**	No action was formulated in the BTFMP. **Action: Create a network of temperature loggers to monitor thermal impacts to streams.** Instream water temperature is monitored annually in cooperation with MBSS and the Izaak Walton League. Each Inland Fisheries Region annually rotates 6 to several dozen

			temperature loggers among priority streams. There are three additional long-term monitoring sites. **Water temperature database development is planned to begin in 2014.**
Strategy 4.5 Designate the upper Savage River watershed a fisheries "Habitat Area of Particular Concern" (HAPC). This designation will allow the development of regulations and monitoring programs to protect the resource on a watershed specific basis. It will also help to develop and foster the public and resource users' support for the management actions that need to occur; it will focus efforts to accomplish necessary research; and it will demonstrate Maryland's commitment to protecting and conserving this unique resource.	**Action 4.5.1** Institute angling regulations to provide for maximum protection of brook trout while still ensuring angler use of the resource, i.e. no closed season, no harvest, single hook barbless lures only, no bait.	2007 2007 – 2013 **On-going**	State fishery regulation was enacted to protect upper Savage River brook trout: COMAR 08.02.11.01. Annual monitoring of trout population response is ongoing through at least 2013. **Results indicate that the regulation has been effective in meeting management objectives to increase the number of fish >200 mm, reduce angler related mortality, and protect the only intact brook trout system in MD (upper Savage River) while optimizing angling use. Restoration of trout population densities has been partially successful. Plans for long term continued monitoring were developed in winter 2014 and implemented in summer 2015.**
Strategy 4.6 Promote and encourage the development of a citizen-based Savage River watershed advocacy organization. MD DNR will provide technical support as needed.		2006 Completed	No action was formulated in the BTFMP. Savage River Watershed Association (SRWA) formed and has partnered with DNR in protecting and restoring the watershed. SRWA framework is being used as a model for other watershed associations. Watershed associations will assist with FMP action implementation.

Objective (Strategy) 5 Encourage riparian buffer habitat preservation and restoration.	**Action 5.1.1** Develop a list of target watersheds in Maryland that could benefit from the CREP program, rank each system based on brook trout population status (best to worst), headwater agricultural impact, and size and connectedness of the system.	Pending	Implementation requires completion of Strategy 4.3. Implementation will aid with at-risk population targeting.
	Action 5.1.1 Using the list generated from Action 5.1.1, actively recruit and enroll farmers from the targeted watersheds into the CREP program.	Pending	Dependent on the completion of Action 5.1.1
	Action 5.1.2 Create a list of the Federal, state, and NGO conservation and restoration programs that are available to landowners; inform Regional Fisheries managers and biologists of these programs so they can work with private landowners to improve land use and water quality.	Pending	No progress to date.
Strategy 6.1 The information that is needed by regulators and developers to appropriately consider and plan activities so they do not adversely impact brook trout populations is available. Developing an outreach strategy to convey this information will provide key agencies and developers with the understanding necessary to make appropriate decisions.	**Action 6.1.1** Develop a series of PowerPoint presentations that illustrate the life history needs of brook trout and the adverse impacts that can occur from anthropogenic activities. Provide an ecosystem perspective by including a description of how brook trout serve as indicators of overall stream health; and what a healthy brook trout population means to the health of a watershed and the lives of those who reside there.	2011 **Completed** 2011 **On-going**	This is the number 4 priority action. **Eastern Brook Trout Joint Venture (EBTJV) developed educational and outreach materials such as videos, webinars, maps, and reports with a national perspective. More information is available at http://easternbrooktrout.org/** **Information from brook trout research and similar efforts is now available to fully develop communication and education tools for protection of brook trout and their**

			habitat in MD. Action 6.1.1 is scheduled for completion in 2016 – 2017.
	Action 6.1.2 Meet with county and local government officials/agencies and commercial developers to present the information and to establish a dialog on the issues relating to the conservation and value of Maryland's native brook trout.	Pending	Requires completion of 6.1.1.
	Action 6.1.3 Make presentations available to the general public through appropriate pathways, i.e. website, libraries, etc.	Pending	Requires completion of 6.1.1.
	Action 6.1.4 Work cooperatively with other state agencies to insure adherence to state water quality standards.	2007 Continue	Better communication fostered between MDE and DNR. DNR environmental review expanded to include teams that address specific water quality issues. Direct negotiations between Inland Fisheries and MDE focused primarily on stream classification.
Strategy 7.1 Develop statewide restoration guidelines for restoring extirpated brook trout populations.	**Action 7.1.1** Adopt and modify the guidelines developed for brook trout restoration by the American Fisheries Society's Southern Division Trout Committee.	**Pending**	This is the number 3 priority action. **Implementation is dependent on information from the life history and genetic research projects (Actions 1.1.1 and 7.1.2) and review of the Southern Division of the American Fisheries Society Technical Committee's (SDAFS TC) guidelines for brook trout restoration. Work is scheduled for 2015 - 2016.**

	Action 7.1.2 Incorporate a genetic component into the guidelines to direct brood fish selection location.	2010 - 2013 2014 Continue	UMCES Appalachian Lab has collected and inventoried brook trout genetics in all watersheds. **Laboratory work and analysis scheduled for winter 2014.**
Objective (Strategy) 8 Complete genetic inventory of discrete brook trout populations.	**Action 8.1** Secure funding (an estimated $10,000) to complete the statewide brook trout genetic inventory. The USFWS State Wildlife Grant Program and EBTJV are two possible funding sources for completing this work.	Pending	Funds are being sought to complete the genetic inventory. **Partially completed in 2014, if funding secured will be fully completed in 2016.**
Strategy 9.1 Establish pathways to inform the general public about brook trout conservation and protection.	**Action 9.1.1** Utilize the Maryland Sport Fisheries Advisory Commission (SFAC), DNR Regional Teams, and other appropriate state agencies to solicit input on brook trout conservation measures.	On-going	Strategy 9.1 aligns with Strategy 6.1. Inland Fisheries advised the MD Taskforce on Fisheries Management and regularly updates the SFAC as new research, monitoring, and regulation information becomes available.
	Action 9.1.2 Post the BTFMP on the DNR Fisheries Service webpage and request on-line comments on conservation measures as part of the regular review of the BTFMP.	2006 Continue **Completed**	Strategy 9.1 aligns with Strategy 6.1. BTFMP posted on line. Trout fishing information is available on the DNR Fisheries Service web site. **A DNR Brook Trout webpage has been completed and provides program information such as management updates, research highlights, and habitat needs. The webpage includes an interactive public comment interface allowing DNR to solicit public input, opinions, and observations regarding current and proposed**

			conservation and management actions.
Strategy 10.1 Encourage public participation in fishery management through informational and regulatory meetings and the development of organized watershed advocacy groups. Current federal efforts are directed at assisting the formation of advocacy groups by funding startup and operational costs.	**Action 10.1** Develop a list of watershed advocacy organizations in Maryland with current contact information. Evaluate the need for additional groups. Create a list of federal agency contacts that can assist with citizen advocacy groups.	2009 **Completed**	A list of watershed groups and advocacy organizations has been created. These organizations have developed their own lists of federal agency contacts.
Strategy 11.1 Develop a consistent, coordinated monitoring program to: 1) assess and track population abundance and viability; 2) monitor and detect environmental changes from anthropogenic (acidification, sedimentation, development/ urbanization, AMD, etc.) and natural causes (floods, drought); 3) monitor and detect exotic species encroachment and impacts; and 4) monitor/detect water flow and temperature changes.	**Action 11.1.1** Develop a monitoring schedule to insure that all brook trout populations statewide are sampled at least once every 3 years.	2008-2009 Completed **2009** **On-going** **2012-2013**	Monitoring plan is a Federal Aid requirement. Comments from the MD Task Force on Fisheries Management and SFAC were incorporated in the plan. **Streams will be monitored on a 5 year rotation from 2014- 2018.** **Brook trout in the upper Savage River were tagged and tracked via radio telemetry. Seasonal distribution was documented and tributary connectivity will be important for effective population management. A manuscript was drafted but study results are not yet available pending publication.**

	Action 11.1.2 Coordinate brook trout sampling efforts between Inland Fisheries and the MBSS to maximize efficiency. Where possible, reduce the number of sites Inland Fisheries needs to monitor. Fisheries should focus on monitoring streams for recreational fisheries, MBSS on sampling headwater, privately owned streams.	Began 2006 Formalized 2010 **On-going**	Inland Fisheries and MBSS have increased sampling coordination. **Action will continue annually.**
Strategy 12.1 Develop a standardized sampling protocol for monitoring brook trout populations that includes: MBSS water quality and habitat data collection components; establishment of permanent sampling stations; number of stations per stream length; and fish collection methodology.	**Action 12.1.1** Create a sampling standardization committee with members from Inland Fisheries and MBSS to develop the sampling methodology.	2006 2011 **Pending**	MBSS sampling protocol informally adopted for portions of the Savage River. MBSS sampling protocol requires more discussion before being implemented statewide. Integration of a multi-layer sampling protocol is being considered as a modification to the MBSS sampling protocol. **Implementation will be in stages with earliest start in 2015.**
	Action 12.1.2 Conduct training with Inland Fisheries staff to implement the standardized methodology.	2011	Completion of Action 12.1.1 is required. Some informal training has been done to date.
	Action 12.1.3 Collect summer water temperatures with in-stream temperature.	2007 **On-going**	Strategy 12.1 aligns with Strategy 4.4. Includes Inland Fisheries efforts and data from MBSS.
Strategy 13.1 Develop a database that incorporates, and where possible, standardizes, the historic and current statewide brook trout information available from the Inland Fisheries, the MBSS,	**Action 13.1.1** Establish a data management group that includes a representative from each of the major groups (DNR, UM, and MBSS) to standardize the data collection format and create a statewide database of brook trout information.	2009 Completed **Continue as needed**	Action 13.1.1 is the number 2 priority (along with Action 3.1.3). **Informal data management group has been established and convenes as needed.**

and the University of Maryland monitoring programs.	**Action 13.1.2** Identify other sources of brook trout data, such as MD Bureau of Mines, additional academic institutions, and Federal agencies, and incorporate the data into the statewide format.	**Completed**	Requires completion of Action 13.1.1.
	Action 13.1.3 Develop a GIS database describing BT population boundaries, population information, habitat variable information, and water temperature data.	2009 **On-going**	Action 13.1.3 was the number 2 priority (along with Action 3.1.1) in 2010. **GIS database was completed and functional in 2013. It will be updated annually.**

Acronyms

AMD – Acid Mine Drainage
BTFMP – Brook Trout Fisheries Management Plan
CREP – Conservation Reserve Enhancement Program
COMAR – Annotated Code of Maryland
EBTJV – Eastern Brook Trout Joint Venture
GEP – Genetic Effective Population
GIS – Geographic Information System
MBSS – Maryland Biological Stream Survey
MD DNR – Maryland Department of Natural Resources
MDE – Maryland Department of the Environment
SDAFS – Southern Division of the American Fisheries Society
SFAC – Sport Fisheries Advisory Commission
SRWA – Savage River Watershed Association
SWG – State Wildlife Grant
TC – Technical Committee